REMARKS

I. Introduction

In response to the May 4, 2011 Office Action, Applicants have amended independent claim 1. Support for the amendment to claim 1 may be found in paragraph [0034] of the specification. Claims 2-5 have been cancelled, without prejudice. Applicants have taken care to avoid the introduction of new matter.

For the reasons set forth below, Applicants respectfully submit that all pending claims are patentable over the cited prior art references.

II. The Rejection of Claims 2-4 Under 35 U.S.C. § 112

Claims 2-4 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite, and under 35 U.S.C. § 112, fourth paragraph, as failing to further limit the claim on which they depend.

Claim 2 recites Al is 0.1 to 12%, which is broader than 5.5-7.2% as recited in claim 1. Claim 3 recites Mn is 0.1-20%, which is outside the range of 0.13 or more as recited in claim 1. Claim 4 recites Zn is 0.1-10%, which is broader than the ranged of 0.4-1.5% and 0.35-1.0% as recited in claim 1.

In response, Applicants have cancelled claims 2-4 to overcome the rejections. As such, Applicants request that the § 112 rejections be withdrawn.

III. The Rejection Of Claims 1-5 and 22-23 Under 35 U.S.C. § 103

Claims 1-3 and 22-23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Oishi et al. (WO 02/099148, citing US 2004/0163744 as English language translation) in view of

Webster's New World Dictionary, Third College Ed. p. 1206; and claims 4 and 5 as being unpatentable over Oishi and *Webster's New World Dictionary* and further in view of Iba et al. (USP No. 5,336,466).

With regard to the present disclosure, amended claim 1 recites a magnesium-based alloy screw having a head portion and a thread portion. The screw is formed from a drawn wire made of a magnesium-based alloy, and the wire has an average crystal grain diameter of 10 μm or less, and a maximum crystal grain diameter of 15 μm or less. The tensile strength of the screw is 220 MPa or higher. The magnesium based alloy contains Al: 5.5 to 7.2% by mass, Zn: 0.4 to 1.5% by mass, Mn: 0.15 to 0.35% by mass, Ni: 0.05% by mass or less, and Si: 0.1% by mass or less, or the magnesium based alloy contains Al: 8.1 to 9.7% by mass, Zn: 0.35 to 1.0% by mass, Mn: 0.13% by mass or more, Cu: 0.1% by mass or less, Ni: 0.03% by mass or less, and Si: 0.5% by mass or less.

One feature of the present disclosure teaches a screw with a tensile strength of 220 MPa or higher formed from a wire. This is done by drawing a magnesium-based alloy that has an average crystal grain diameter of 10 μm or less, and a maximum crystal grain diameter of 15 μm or less, and the magnesium based alloy contains Al: 5.5 to 7.2% by mass, Zn: 0.4 to 1.5% by mass, Mn: 0.15 to 0.35% by mass, Ni: 0.05% by mass or less, and Si: 0.1% by mass or less, or the magnesium based alloy contains Al: 8.1 to 9.7% by mass, Zn: 0.35 to 1.0% by mass, Mn: 0.13% by mass or more, Cu: 0.1% by mass or less, Ni: 0.03% by mass or less, and Si: 0.5% by mass or less. As a result of this feature, the screw having excellent tensile characteristics can be formed at temperatures lower than the usual temperature at which magnesium-alloys are worked.

In contrast to the present disclosure, Oishi fails to disclose a specific screw or any specific method of forming a screw. Oishi only generally states in ¶ [0045] that the *wire*

disclosed in the reference can be used in a wide range of applications, such as springs, a reinforcing frames, and screws. However, there is no indication based on Oishi that a screw having a tensile strength of 220 MPa can be made.

It is known that magnesium and its alloys have drawbacks of having poor ductility and extremely poor plastic workability at low temperatures, such as room temperature, due to their hexagonal close-packed lattice structure (hcp). It is known that if magnesium-based alloys were to be worked into other objects, they should be worked at a temperature at which plastic workability is increased, for example, a temperature of 250 °C or higher. Thus, a skilled artisan would carry out plastic working on magnesium-based alloys at even higher temperatures exceeding 250 °C if such alloys contained high Al content of 5.5% or more in their compositions, such as AZ 61 and AZ91, in the conventional technique at the time the application was made.

However, when working temperature is increased to 250 °C or higher, grain growth advances and grain structure becomes coarse with the increase in temperature, thereby resulting in the degradation of mechanical properties of the obtained screw. This is because if there are even a small number of coarse grains in the alloy structure, stress concentrates at spots resulting in cracking which decreases the tensile strength and toughness of the screw formed.

In contrast, because it is worked at temperatures lower than 250 °C at which grain growth is suppressed and grain structure is prevented from becoming coarse, a screw of claim 1 can be formed that has a tensile strength of 220 MPa or higher. There is no indication in either Oishi or Webster's that a screw is formed at these temperatures, and the conventional method of forming a screw at the time of Oishi would result in a screw not having the claimed tensile strength. As such, it is clear that Oishi and Webster's do not teach or suggest the limitations of claim 1.

As Oishi and Webster's New World Dictionary do not disclose a magnesium-based alloy screw formed from a drawn wire made of a made from a magnesium based alloy which has an average crystal grain diameter of 10 μm or less, and a maximum crystal grain diameter of 15 μm or less, and the magnesium based alloy contains Al: 5.5 to 7.2% by mass, Zn: 0.4 to 1.5% by mass, Mn: 0.15 to 0.35% by mass, Ni: 0.05% by mass or less, and Si: 0.1% by mass or less, or the magnesium based alloy contains Al: 8.1 to 9.7% by mass, Zn: 0.35 to 1.0% by mass, Mn: 0.13% by mass or more, Cu: 0.1% by mass or less, Ni: 0.03% by mass or less, and Si: 0.5% by mass or less, it is apparent that Oishi and Webster's New World Dictionary fail to render amended claim 1 or any dependent claims thereon obvious. Accordingly, the Applicants respectfully request that the § 103 rejection be withdrawn.

IV. All Dependent Claims Are Allowable Because The Independent Claim From Which They Depend Is Allowable

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as amended claim 1 is patentable for the reasons set forth above, it is respectfully submitted that all pending dependent claims are also in condition for allowance.

V. Conclusion

Having responded to all open issues set forth in the Office Action, it is respectfully submitted that all claims are in condition for allowance.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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